

Final Meeting Summary
AOC Parties Technical Working Group Meeting No. 2
AOC SOW Section 6 and Section 7
Red Hill Bulk Fuel Storage Facility,
Joint Base Pearl Harbor-Hickam, O‘ahu, Hawai‘i

Date: March 2, 2018

Time: 0830 to 1050 HST

Location: Hawaii Department of Health Solid & Hazardous Waste Branch/Teleconference

1. ATTENDEES

A meeting was held to discuss matters related to the Administrative Order on Consent (AOC) in the Matter of Red Hill Bulk Fuel Storage Facility (“Facility”), EPA Docket Number RCRA 7003-R9-2015-01, and DOH Docket Number 15-UST-EA-01, Attachment A, Statement of Work Sections 6 and 7. Attendees for the meeting included Parties to the AOC (Environmental Protection Agency [EPA] Region 9, State of Hawai‘i Department of Health [DOH], Navy) and their contractors as follows: Innovex Environmental Management, Inc. for EPA; Aqui-ver, Inc. for DOH; and AECOM Technical Services, Inc. (AECOM), GSI Environmental, Inc. (GSI), and Dr. Lee Liberty of Boise State University for the Navy.

The agenda for the meeting included an acknowledgement of the overarching concerns presented in the Regulatory Agencies’ letter dated February 23, 2018, a review of the topics discussed during the AOC Parties Technical Working Group Meeting No. 1 on February 8, 2018, and specific agenda topics including the following:

- Conceptual Site Model (CSM) Report and Table of Contents
- Seismic Survey: Discussion of Interpretations and Results with Prof. Lee Liberty, and Application to the Project and Models;
- Geologic CSM: Addressing Overarching Concerns (Portion);
- Data Collection Priorities and Rationale;
- Groundwater Modeling Critical Path and Schedule; and,
- Summary and Next Steps

A summary of the meeting is provided below.

2. BRIEF REVIEW OF MEETING NO. 1 TOPICS AND OVERARCHING CONCERNS IN EPA/DOH LETTERS

The meeting attendees discussed that the Technical Working Group meetings will focus on the details of the investigation and data collected to help Subject Matter Experts (SMEs) get the information needed to better understand the site.

The Navy noted that the Regulatory Agencies’ letter was received on February 23, 2018 and advised that a response letter will be submitted addressing the overarching comments expressed in the letter. The Regulatory Agencies noted the need for the Navy to respond to the concerns in a granular fashion regarding the basis for technical assumptions or analyses being conducted by the Navy and their contractors rather than providing a big picture discussion. The intent is to allow the Regulatory Agencies’ consultants to understand the CSM at a detailed level rather than a coarse regional level.

The Navy also discussed that the Technical Working Group meetings will provide the format for detailed discussions to occur.

The meeting participants also discussed that meeting summaries will be submitted by the Navy to the Regulatory Agencies within 10 days of the meeting date.

3. CONCEPTUAL SITE MODEL REPORT

The Navy presented the outline of the CSM report and noted that only a portion of the CSM has been presented during previous meetings. The Navy indicated that the AOC Parties have not yet seen the overall CSM, and that much of the detail that the Regulatory Agencies are requesting is contained in the CSM report. The Navy discussed that the document is currently under review and will be forthcoming.

4. SEISMIC SURVEY INTERPRETATION AND RESULTS

Field observations, results, and data interpretations were presented for nine transects completed during the seismic survey conducted at North and South Hālawā Valleys, Moanalua Valley, and Red Hill. Seismic refraction and reflection data for each of the transects were shown in graphical format, and the rationale for selection of the top and base of saprolite was discussed. The largest amplitude reflectors were interpreted as being indicative of the largest seismic velocity contrast boundary and were used to select the top and base of the saprolite layers. It was explained that seismic velocity contrasts between different geologic units cause the occurrence of large-amplitude reflectors. The Navy consultants also discussed that seismic refraction data provide more detailed data for interpretation compared to reflection data, but that reflection data penetrate deeper into the subsurface.

The limitations and uncertainties of the data were discussed. The availability of confirmation boreholes was discussed and it was noted that confirmation boreholes were evaluated along Transect G and provided good correlation with the seismic data. It was noted that core holes are not needed along every transect, and that a core hole is currently planned adjacent to Transect E.

The Navy consultants were asked how confident they were in the depths selected for top and base of saprolite, and they noted that the refraction data provide reliable data at shallow depths and a reflection velocity analysis can help refine deeper depths; however, the short length of the geophone string was a limiting factor for some transects. Dr. Liberty also noted that the error in reflector depths related to his pick of the base of saprolite may be $\pm 10\%$. It was noted that this could be addressed in an uncertainty analyses and if possible a percent of error included in the CSM report. The Navy consultants further noted that if there are hard boundaries, then it is best to rely on hard velocity changes. Clarification was provided regarding the seismic velocities of saprolite used in this study and those provided in literature from other locations.

It was noted that there are multiple reflectors in some transects (e.g., Transect A). It was asked whether apparent reverberations of the seismic waves show multiple copies of the same reflection, potentially yielding inaccurate results. It was noted that topographic differences could result in out-of-plane reflections; however, the Navy consultant did not think this is the case because he did not see multiple reflections out-of-plane.

The Regulatory Agencies' consultants noted that the primary issue is understanding the geometry of the saprolite and the variability in the characteristics (e.g., hydraulic conductivity) of the hydrostratigraphic units. The Navy consultant noted that the seismic images reflect changes in the underlying material but do not necessarily reflect changes in hydraulic conductivity. This is an

important consideration that relates to fluid transport and risk. It was noted that some transects have clear reflections that were picked, while others have shorter and deeper reflections picked. The Navy consultant indicated that the 3-kilometer/second contour should be shown better on the graphics to clarify picks, and that the largest amplitude reflector and not the deepest reflector was selected as the base of saprolite. It was further noted that the largest amplitude reflector represents a significant contrast in geologic properties.

The Regulatory Agencies asked if there was any structural difference observed along Transect G. It was noted that any hard boundaries occurring at shallow depths are difficult to see, and that there is a difference in reflectors at depth observed in Transect G.

5. GEOLOGIC CONCEPTUAL SITE MODEL

Core photos and logs from recently installed monitoring wells and cross sections were presented by the Navy to show the different geologic units observed at the site. Based on recent logs from core holes, it was noted that it is likely that the tank barrel logs overestimate the clinker layers as the a'ā and pāhoehoe layers are not differentiated in the barrel logs. The depth of the saprolite based on the driller's log for well HDMW2253-03 was discussed, and the Navy noted that their selection (280 feet below ground surface [bgs]) was based on weathering noted in the log. The AOC Parties indicated that their interpretation is that the impermeable saprolite appears to end at a depth of approximately 230 feet bgs. The Navy noted that additional borings with continuous coring are planned to provide more data to evaluate the variability in the subsurface and define the transition from saprolite to unweathered basalt, with a focus on RHMW13 located in Hālawā Valley and a core hole in the vicinity of well HDMW2253-03.

Observations and data from RHMW11 and historical files from investigations performed at the Hālawā Correctional Facility suggest that the previous conceptualization of a perched groundwater system in the area may actually be a continuously saturated section starting in the shallow subsurface and extending downward to the regional basalt aquifer. Even if there is a shallow perched zone, the water level within the saprolite is significantly higher than what would be expected in the basal aquifer at that location.

The Regulatory Agencies' consultants indicated that petrographic analyses proposed for cores tend not to reflect field conditions very well. The Navy responded that the procedures for the proposed petrographic analyses are presented in the published *Attenuation Evaluation Plan* and the *Sampling and Analysis Plan Addendum 02*. All parties agreed that these procedures should be reviewed and consensus regarding their usefulness would need to be reached in order to proceed with or cancel the planned laboratory analyses.

The Navy presented a component of the CSM describing how LNAPL may migrate through the vadose zone after a release occurs. The key elements of this model relate to multiple, relatively thin flows, with the preferential flow paths occurring primarily in clinker zones and to a lesser degree in fractures/joints that extend through individual flows. It was noted that many of the fractures that have been mapped have relatively small apertures and are also weathered in many cases. The figure also described that pāhoehoe flows may have the ability to transport LNAPL to some degree, as well as the ability to retain LNAPL.

6. DATA COLLECTION PRIORITIES AND RATIONALE

Data collection priorities presented during the meeting included upcoming drilling and well installation, as wells as a brief discussion of the planned location of RHMW07D. The location of RHMW07D will require additional evaluation and further discussion among the AOC Parties. The

drilling priorities discussed included planned installation of monitoring wells RHMW13 and RHMW14, as well as the core hole near HDMW2253-03. The parties also discussed if cores from the quarry are available, and ways to see site geology. Suggestions on seeing the area geology include an evaluation of rock exposures mapped by the Navy along the north side of Red Hill and a visual inspection from the valleys adjacent to Red Hill.

7. GROUNDWATER MODELING CRITICAL PATH AND SCHEDULE

The groundwater modeling critical path schedule was provided to attendees, noting key tasks and milestones that will need to be completed. Meeting participants also discussed using the Technical Working Group as a way for the Regulatory Agencies to view available data sooner, rather than waiting for a report.

8. SUMMARY AND NEXT STEPS

The AOC Parties discussed that the next public meeting is scheduled for March 14, 2018, and the Groundwater Flow Model Working Group meeting is scheduled for the afternoon of March 15, 2018. Arrangements were made to schedule a Facility tour on the afternoon of March 14, and a field geology trip for the Regulatory Agencies' consultants on the morning of March 15, 2018. The Navy indicated that cores will be available for viewing at the AECOM warehouse, but requested that specific core depths of interest to be inspected be identified ahead of time due to time constraints.

Meeting adjourned.